AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. - 10. (canceled).

11. (previously presented): A drop-on-demand ink-jet printing head comprising:

a nozzle plate having an array of a plurality of nozzle apertures;

an array of a plurality of piezoelectric elements arranged at regular intervals and fixed at one end thereof to a base, other ends of said piezoelectric elements, respectively, being free ends which are in opposition to respective ones of said nozzle apertures;

ink reservoir portions disposed between said nozzle apertures and said free ends,

wherein said piezoelectric elements are formed by cutting into divided pieces, at predetermined widths, a piezoelectric plate obtained by a lamination of at least two layers of piezoelectric material and at least two layers of conductive material stacked alternately in layers; and

a vibration plate being driven by said piezoelectric element array and interposed between said nozzle plate and said piezoelectric element array,

wherein ink droplets are ejected in a same direction as a main vibration direction of said vibration plate.

12. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein said piezoelectric plate is obtained by one of firing and burning a lamination of paste-like piezoelectric material and conductive material stacked alternately in layers.

13. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein said ink reservoirs are formed by providing recess portions in a spacer interposed between said nozzle plate and said vibration plate.

14. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein said ink reservoirs are formed by providing recess portions in one of said nozzle plate and said vibration plate.

15. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein elastic material is injected between adjacent piezoelectric elements.

16. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein recess portions are formed at said nozzle apertures opposite to said free ends of respective piezoelectric elements.

17. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein each of said piezoelectric elements has an immovable area at a base side.

18. (previously presented): The drop-on-demand ink-jet printing head according to claim 17, wherein said immovable area has a length equal to a quarter of a vibration wavelength of said piezoelectric element.

19. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, further comprising a viscoelastic material layer interposed between said piezoelectric elements and said base so as to fix said piezoelectric elements to said base.

20. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, further including slits which are formed in said piezoelectric elements at a base side thereof.

21. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein said nozzle plate is supported by a support member so as to be disposed in opposition to said free ends of said piezoelectric elements with a predetermined space therebetween.

22. (previously presented): The drop-on-demand ink-jet printing head according to claim 21, wherein said support member comprises a piezoelectric element plate.

23. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein a direction of the cutting is disposed by a predetermined angle from a direction perpendicular to a direction of said array of said nozzle apertures.

24. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein said piezoelectric material and said conductive material are laminated in parallel to said piezoelectric plate.

25. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, wherein said piezoelectric material and said conductive material are laminated perpendicular to said piezoelectric plate.

26. (previously presented): The drop-on-demand ink-jet printing head according to claim 11, further including support members which are disposed on both sides of respective piezoelectric elements.

27. (previously presented): A drop-on-demand ink-jet printing head, comprising:

a nozzle plate having an array of a plurality of nozzle apertures;

an array of a plurality of piezoelectric elements arranged at regular intervals and fixed at one end thereof to a base, other ends of said piezoelectric elements, respectively, being free ends which are in opposition to respective ones of said nozzle apertures;

ink reservoir portions disposed between said nozzle apertures and said free ends,

wherein said piezoelectric elements are formed by cutting into divided pieces, at predetermined widths, a piezoelectric plate obtained by a lamination of at least two layers of piezoelectric material and at least two layers of conductive material stacked alternately in layers; and

a vibration plate interposed between said nozzle plate and said piezoelectric element array, said vibration plate having concave portions in a vicinity of portions where said vibration

plate contacts said piezoelectric elements, said vibration plate being driven by said piezoelectric element array,

whereby ink droplets are ejected in a same direction as a main vibration direction of said vibration plate.

28. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein the said piezoelectric plate is obtained by one of firing and burning a lamination of paste-like piezoelectric material and conductive material stacked alternately in layers.

29. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein said ink reservoirs are formed by providing recess portions in a spacer interposed between said nozzle plate and said vibration plate.

30. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein said ink reservoirs are formed by providing recess portions in one of said nozzle plate and said vibration plate.

31. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein elastic material is injected between adjacent piezoelectric elements.

32. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein recess portions are formed at said nozzle apertures opposite to said free ends of respective piezoelectric elements.

33. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein each of said piezoelectric elements has an immovable area at a base side.

34. (previously presented): The drop-on-demand ink-jet printing head according to claim 33, wherein said immovable area has a length equal to a quarter of a vibration wavelength of said piezoelectric element.

35. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, further comprising a viscoelastic material layer interposed between said piezoelectric elements and said base so as to fix said piezoelectric elements to said base.

36. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, further including slits which are formed in said piezoelectric elements at a base side thereof.

37. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein said nozzle plate is supported by a support member so as to be disposed in opposition to said free ends of said piezoelectric elements with a predetermined space therebetween.

38. (previously presented): The drop-on-demand ink-jet printing head according to claim 37, wherein said support member comprises a piezoelectric element plate.

39. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein a direction of the cutting is disposed by a predetermined angle from a direction perpendicular to a direction of said array of said nozzle apertures.

40. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein said piezoelectric material and said conductive material are laminated in parallel to said piezoelectric plate.

41. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, wherein said piezoelectric material and said conductive material are laminated perpendicular to said piezoelectric plate.

42. (previously presented): The drop-on-demand ink-jet printing head according to claim 27, further including support members which are disposed on both sides of respective piezoelectric elements.

43. (previously presented): A drop-on-demand ink-jet printing head, comprising:

a nozzle plate having an array of a plurality of nozzle apertures;

an array of a plurality of piezoelectric elements arranged at regular intervals and fixed at one end thereof to a base, other ends of said piezoelectric elements, respectively, being free ends which are in opposition to respective ones of said nozzle apertures;

ink reservoir portions being formed between said nozzle apertures and said free ends;

wherein said piezoelectric elements are formed by cutting into divided pieces, at predetermined widths, a piezoelectric plate arranged on said base parallel therewith, said piezoelectric plate being obtained by a lamination of at least two layers of piezoelectric material and at least two layers of conductive material stacked alternately in layers; and

a vibration plate which is driven by said piezoelectric element array and interposed between said nozzle plate and said piezoelectric element array, whereby ink droplets are ejected in a same direction as a main vibration direction of said vibration plate.

44. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein said piezoelectric plate is obtained by one of firing and burning a lamination of paste-like piezoelectric material and conductive material stacked alternately in layers.

45. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein said ink reservoirs are formed by providing recess portions in a spacer interposed between said nozzle plate and said vibration plate.

46. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein said ink reservoirs are formed by providing recess portions in one of said nozzle plate and said vibration plate.

47. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein elastic material is injected between adjacent piezoelectric elements.

48. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein recess portions are formed at said nozzle apertures opposite to said free ends of respective piezoelectric elements.

49. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein each of said piezoelectric elements has an immovable area at a base side.

50. (previously presented): The drop-on-demand ink-jet printing head according to claim 49, wherein said immovable area has a length equal to a quarter of a vibration wavelength of said piezoelectric element.

51. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, further comprising a viscoelastic material layer interposed between said piezoelectric elements and said base so as to fix said piezoelectric elements to said base.

52. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, further including slits which are formed in said piezoelectric elements at a base side thereof.

53. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein said nozzle plate is supported by a support member so as to be disposed in opposition to said free ends of said piezoelectric elements with a predetermined space therebetween.

54. (previously presented): The drop-on-demand ink-jet printing head according to claim 53, wherein said support member comprises a piezoelectric element plate.

55. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein a direction of the cutting is disposed by a predetermined angle from a direction perpendicular to a direction of said array of said nozzle apertures.

56. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein said piezoelectric material and said conductive material are laminated in parallel to said piezoelectric plate.

57. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, wherein said piezoelectric material and said conductive material are laminated perpendicular to said piezoelectric plate.

58. (previously presented): The drop-on-demand ink-jet printing head according to claim 43, in which support members are disposed on both sides of respective piezoelectric elements.

59. (new): A drop-on-demand ink-jet printing head comprising:

a vibration plate;

a nozzle plate having an array of a plurality of nozzle apertures;

an array of a plurality of piezoelectric elements arranged at regular intervals and fixed at one end thereof to a base, other ends of said piezoelectric elements being fixed to the vibration plate; and

ink reservoir portions disposed between said nozzle plate and said vibration plate,

wherein each of said piezoelectric elements has a lamination of at least two layers of piezoelectric material and at least two layers of conductive material stacked alternately in layers,

wherein the vibration plate is driven by said piezoelectric element array and interposed between said nozzle plate and said piezoelectric element array, and

wherein ink droplets are ejected in a same direction as a main vibration direction of said vibration plate.

60. (new): The drop-on-demand ink-jet printing head according to claim 59, further comprising concave portions formed in the vibration plate in a vicinity of portions where said vibration plate contacts said piezoelectric elements.

61 (new): The drop-on-demand ink-jet printing head according to claim 59, wherein said piezoelectric elements are arranged on said base parallel therewith.